

office computers that can be programmed to bring greater efficiency into our office practices. We are even led to believe that all future kitchens will have their own computers. The Japanese are sending us tiny computerized TV sets no larger than a cigarette package. Recently television has brought into our living rooms bank upon bank of computers that guided Columbia into outer space.

What wonders our scientists and our engineers have wrought—almost beyond belief. But have we ever stopped to contemplate the even greater wonders of the computerization we carry around in our bodies? In comparison to the electronic wizardry in our central nervous system Detroit's solid-state black box computers are primitive calculators.

It has long been known that the central nervous system is a complex electrochemical communications apparatus, capable of transmitting instantaneous messages throughout our bodies. Now, the electron microscope has enabled us to look inside the individual nerve cell, the neuron, with all its capabilities.

Electron microscopists peering through the neuron cell membrane, discovered a beehive of activity. Each of the 7 billion neurons, acting as separate biologic entities, are constantly sending out and receiving millions of computerized messages. Each neuron has some 5,000 neurotransmitters and neuroreceptors—our “on-board” computer—to guide and regulate every body function.

The substances we feed into our body's computer, whether food, water, oxygen or drugs, are promptly acted upon as programmed. Ten years ago research workers at Stanford discovered that the impulses received by the neuron were acted upon by “receptors.” A chemical, whether food or drug, acting upon these receptors, could elicit either an “excitatory” or “inhibitory” response. An excitatory impulse could result in pleasure and enhanced body function. An inhibitory impulse could be blocked by the neuron, producing what we recognize as pain, anger, anxiety. The neuron might even produce endorphin—inner morphine—to relieve mental anguish. This keeps us humble. We are reminded of the responsibility we shoulder as we go about caring for our patients' minds and bodies.

We all witnessed a frustrating two-day delay in the launching of the space shuttle when the master computer and the backup computers were sending each other scrambled messages. Are we aware, always, that the drugs we prescribe and the chem-

icals we administer to our trusting patients may send garbled or blocking messages to their neurons? Will we harm or injure these ultrasophisticated human computers?

We envy those automotive engineers in Detroit. They can take out, look at and repair a solid-state black box. Ours is the awesome responsibility of manipulating, protecting, preserving 7 billion delicate, intangible nerve cells. That's a responsibility not to be taken lightly.

E. R. W. FOX, MD
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A Case in Point

TO THE EDITOR: I have just finished reading your editorial “Financial Aid for Medical Students.”¹ I am just completing my first year at the University of Southern California School of Medicine and am one of the medical students to whom you are referring in your editorial. I already have \$10,500 in loans. More important, however, I have a real concern about how I will get enough loan money to complete my education. Tuition next year is more than \$9,400 and, with books, supplies and living expenses, my budget approaches \$18,500. The school can only be of minimal assistance, and with expected changes in government programs, I cannot count on getting enough money to meet my needs, either next year or in the years following.

First, I want to thank you for bringing this problem to the attention of physicians in practice. Second, should any of these physicians show an interest in “assisting needy medical students,” I would appreciate it if you would give them my name and address.

DEBORAH OLES, MSW
Los Angeles

REFERENCE

1. Financial aid for medical students (Editorial). *West J Med* 134:440, May 1981

Violence by Handguns—Commentary

TO THE EDITOR: The editorial concerning violence by handguns¹ aptly pointed up the precondition behind the epidemic of death by firearms in remarking on this nation's “infatuation with violence . . . [through] entertainment. . . .” Violence via television and motion pictures *reflects* but does not *cause* our national preoccupation with guns. The problem is primarily in the national psyche and secondarily in handgun control, which I also believe is a necessity.

However, my interest is in the public's uncon-

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scious and conscious participation in violent crime as measured by the persistence, even flowering, of crime movies featuring violent death. In a recent address, before the Academy of Forensic Psychiatry (New Orleans, May 10, 1981),² I proposed the rewriting of crime stories on television in such a way as to expose the public's fascination with violence through entertainment vehicles. Since our society loves its crimes but hates its criminals, television dramas should illuminate this psychologic background of our feelings and hence permit them to be viewed objectively. Entertainment is a more powerful medium than preachment or exhortation, and television admittedly is our most powerful persuader.

A rewriting of violence dramas may take a generation to reorient the American public to its own aggressive nature. This sugarcoated therapeutic experiment (via entertainment) would be sobering to the coming generation from whom assaultive criminals will emerge. As it is, the writers' presentations cater to our aggressive impulses almost automatically. Skillful writers and directors could turn the stories around so that the true psychological state of affairs would be presented with no loss in entertainment value and a great gain in insight. Such an attempt could not help but be a factor in time in the prevention of violence.

WALTER BROMBERG, MD
Sacramento, California

REFERENCES

1. Violence by handguns (Editorial). West J Med 134:438, May 1981
2. Bromberg W: Law and psychiatry—A stormy marriage. Bull Am Acad Psychiatry Law, In press, 1981

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TO THE EDITOR: Attempts to thwart the "agents of transmission" of illegal drugs into our country are made daily (even if not always successfully) by all agencies of government. Similar efforts to minimize, if not curtail, the unlawful use of handguns should also be made. The medical profession belongs in the vanguard of such a crusade, despite some of the obstacles facing it, just as it has often been in its fight against disease.

The "acceptance and approval from the public at large" of the use of handguns which you bemoan in your editorial¹ in the May issue are the defenses employed by a concerned and frightened public. If the gun lobby was as concerned with saving lives as are doctors who must bear witness to the results of such carnage, the agents of transmission which masquerade under different colors would find their specious arguments short-circuited.

I invite you to help us grope toward a solution rather than for you to invite us to accept what you consider to be inevitable.

MURRAY KLUTCH
Berkeley, California

REFERENCE

1. Violence by handguns (Editorial). West J Med 134:438, May 1981

Management of Thyroid Nodules

TO THE EDITOR: The study by Miller, Abele and Greenspan on fine-needle aspiration (FNA) biopsy for thyroid nodules in the March 1981 issue¹ fails to show that FNA actually leads to avoidance of surgical intervention. In their proposed management plan it is apparent that if a nodule is "suspicious" on FNA biopsy an operation will be carried out. If it is not suspicious or benign then suppression is undertaken. If the mass does not regress it is removed.

This same plan of approach can be and has been undertaken without fine-needle aspiration. Whatever the FNA biopsy shows, if a solitary nodule persists it will be removed surgically.

FRANK P. BONGIORNO, MD
Martinez, California

REFERENCE

1. Miller TR, Abele JS, Greenspan FS: Fine-needle aspiration biopsy in the management of thyroid nodules. West J Med 134: 198-205, Mar 1981

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The Authors Reply

TO THE EDITOR: Dr. Bongiorno's statement that use of fine-needle aspiration (FNA) does not avoid surgical procedures on benign thyroid nodules is an incorrect conclusion drawn from our decision matrix, Figure 9. The last box of that figure states that failure of a nodule to regress leads to *rebiopsy* or *excision* of the nodule. The rebiopsy option means nonsurgical clinical observation with repeat FNA as the clinician desires.

The advantage of FNA is that it is a rapid test which is done at no significant risk to the patient. If a nodule is clearly malignant or suspicious in a high-risk patient, there is no delay in surgical removal. On the other hand, if the nodule is clearly benign or suspicious in a low-risk patient, an operation may be avoided. In fact, surgical procedures were avoided in 101 of the 129 patients in this study who clinically had solitary cold nodules. FNA in conjunction with clinical evaluation provides improved selection of patients for medical surgical management of thyroid nodules.

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